

CLAIMS:

1. A method for removing contaminant particles from a substrate surface, comprising:
 - supporting a substrate in a face up position on a substrate support member;
 - imparting a broadband impulse to the substrate support member in a direction that is substantially perpendicular to a surface of the substrate, the broadband impulse being of sufficient magnitude to dislodge contamination particles from the surface of the substrate; and
 - removing dislodged particles from an area proximate the substrate surface.
2. The method of claim 1, wherein supporting a substrate comprises vacuum chucking the substrate to a substrate receiving surface of the substrate support member.
3. The method of claim 1, wherein imparting a broadband impulse comprises actuating a piston assembly positioned in a stem of the substrate support member, the actuation causing the piston assembly to travel toward the substrate and contact a terminating end, the contact with the terminating end operating to generate the broadband impulse.
4. The method of claim 1, wherein removing dislodged particles comprises actuating an air knife assembly positioned proximate a perimeter of the substrate support member.
5. The method of claim 1, wherein removing dislodged particles comprises generating a laminar flow of gas across the substrate surface.
6. The method of claim 1, wherein removing dislodged particles comprises generating a plasma above the substrate support member, wherein the plasma is configured to attract dislodged particles.

7. The method of claim 1, wherein removing dislodged particles comprises pumping the dislodged particles into a pumping channel that is circumferential to a perimeter of the substrate support member.
8. The method of claim 1, further comprising analyzing the substrate surface with an inspection station and determining a force to be applied to the substrate that is sufficient to dislodge particles therefrom.
9. The method of claim 8, wherein the analyzing step includes using a metrology station.
10. A method for cleaning contaminants from a substrate surface, comprising:
clamping a substrate to a substrate support member;
communicating a broadband impulse to the substrate support member; and
removing dislodged particles from an area proximate the substrate surface with an air knife assembly.
11. The method of claim 10, wherein clamping the substrate comprises vacuum chucking the substrate to a substrate receiving surface of the substrate support member.
12. The method of claim 10, wherein communicating a broadband impulse comprises:
generating a broadband impulse with a broadband actuator device positioned in a stem portion of the substrate support member; and
transferring the broadband impulse to a substrate receiving surface having a substrate clamped thereto via a substrate reinforcement member positioned between the substrate receiving surface and the stem portion.
13. The method of claim 10, wherein generating the broadband impulse comprises actuating a slidable piston assembly longitudinally positioned in the stem

portion and allowing the piston assembly to contact a terminating end to transfer a broadband impulse to the stem portion.

14. The method of claim 10, wherein transferring the broadband impulse to the substrate receiving member comprises positioning a semi-hemispherical reinforcement member between the substrate receiving member and the stem portion, the semi-hemispherical reinforcement member being configured to transfer the broadband impulse to the substrate receiving member with minimal deflection to the substrate receiving member.

15. The method of claim 14, wherein transferring the broadband impulse to a substrate receiving surface further comprises forming a plurality of reinforcement ribs into an under side of the substrate support member, the plurality of reinforcement ribs being configured to transfer a broadband impulse from the semi-hemispherical reinforcement member to the substrate receiving member.

16. The method of claim 10, wherein removing dislodged particles from the area proximate the substrate surface comprises generating a laminar flow of gas across the substrate surface.

17. A method for removing contaminant particles from a substrate surface, comprising:

securing a substrate to a substrate support member with a means for securing;

actuating the substrate support member with a broadband impulse with a means for actuating, the means for actuating being in communication with the substrate support member via a semi-hemispherical reinforcement member; and

removing particles dislodged from the substrate surface with a means for removing.

18. The method of claim 17, wherein securing the substrate comprises at least one of vacuum chucking the substrate, e-chucking the substrate, and mechanically clamping the substrate.

19. The method of claim 17, wherein actuating the substrate support member comprises providing a broadband actuator in a stem portion of the substrate support member, the broadband actuator being configured to impart a broadband impulse to the substrate support member.

20. The method of claim 17, wherein removing particles dislodged from the substrate surface comprises actuating an air knife assembly to generate a laminar flow of gas across the substrate surface.

21. The method of claim 17, wherein removing particles dislodged from the substrate surface comprises generating a plasma above the substrate support member, the plasma being configured to attract dislodged particles.

22. The method of claim 17, wherein removing particles dislodged from the substrate surface comprises providing a circumferential pumping channel surrounding the substrate support member, the circumferential pumping channel being in communication with a pumping device.